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SUBJECT: Submission of Enclosed Documents into DTIC Reference Network

REFERENCE: Army Contract Number DABT60-90-D-0010

Dear Sirs:

1. Pursuant to directions from the Contracting Officer and Contracting Officer's Representative (COR), two copies of the following enclosed documents are submitted for inclusion in your reference network:

-- Non-Line of Sight - Combined Arms (NLOS-CA) Manpower, Personnel and Logistics Impact Analyses (LIA), 15 November 1993

-- Non-Line of Sight - Combined Arms (NLOS-CA) Manpower Personnel Analysis (MPA) and Logistics Impact Analyses (LIA) Abstract, 15 November 1993

2. Please acknowledge receipt of this document by signing in the space below and returning a copy of this letter to:

Director, TRADOC Analysis Center  
ATTN: ATRC-LP (Dr. Gordon Goodwin)  
Building 1109, Room 427  
Ft. Lee, VA 23801-6140

3. Should any questions or concerns arise, please feel free to call Dr. Gordon Goodwin, the contract's COR, at (804) 765-1811, or myself at (301) 670-6770.

Sincerely,



ROBERT A. CLARKE  
Program Manager

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**NON-LINE OF SIGHT - COMBINED ARMS (NLOS-CA)  
MANPOWER PERSONNEL ANALYSIS (MPA)  
AND LOGISTICS IMPACT ANALYSES (LIA)**

**ABSTRACT**

1. **INTRODUCTION.** The purpose of these analyses was to identify manpower, personnel and logistics impacts caused by fielding the Non-Line of Sight - Combined Arms (NLOS-CA) weapon system (WS). These analyses were conducted as integral parts of the NLOS-CA Cost and Operational Effectiveness Analyses (COEA) study. The COEA Study Plan (SP) was prepared by the TRADOC Analysis Center (TRAC) - White Sands Missile Range (WSMR), NM (the study agency). These analyses were conducted under the supervision of TRAC - Fort Lee (TRAC-LEE), VA. The results of the analyses were provided to TRAC-WSMR for integration into the COEA and for use as source documents for the Milestone (MS) II Decision Review (MDR).

2. **SCOPE.** This study assessed the logistics, manpower, and personnel impacts of the two alternatives for the NLOS-CA WSs. Those impacts were assessed for a Brigade slice or one NLOS-CA company. An assessment of physical requirements and training prerequisites for system operators was also conducted as part of the MPA. The Base Case is the current force structure. This structure was not included in the study. The two alternatives are as follows:

A. Alternative 1. The NLOS-CA is Alternative 1. This system consists of a gunner's station and fiber-optic guided missile (FOG-M) launcher subsystem mounted on a High Mobility Multipurpose Wheeled Vehicle (HMMWV) in both heavy and light configurations. The missiles will be stored, transported and loaded in a unitized launch-storage container with a six-round capacity. Cameras and sensors in the FOG-M enable the gunner to identify and engage targets at a range of several kilometers while remaining within the protection of cover. The NLOS-CA will be a Brigade asset which will receive targeting information from the Brigade Tactical Operations Center (TOC). The WS will be fielded as a company assigned to both light and heavy brigades.

B. Alternative 2. The LRSM is Alternative 2. This is a notional system. For this study, it is defined as the 120mm, Battalion Mortar System (BMS) now in the field, but armed with precision-guided mortar munitions. Employment and doctrine for the LRSM have not been formally defined. For this study, LRSM will replace NLOS-CA systems one-for-one in NLOS-CA companies. NLOS-CA Operational Mode Summary/Mission Profile (OMS/MP) and operational concepts will apply to the LRSM. This alternative was studied in two versions. The light version will be transported in a HMMWV and unloaded manually for firing. The heavy version will be mounted in the M1064, M113A derivative, tracked carrier designed for the 120mm BMS.

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3. **TECHNICAL APPROACH.** The LIA of the NLOS-CA alternatives was assessed against the following seven Essential Elements of Analysis (EEA): (1) What are the supply differences between the alternatives; (2) What are the maintenance differences between the alternatives; (3) What are the transportation differences between the alternatives; (4) What are the Combat Service Support (CSS) Force Structure differences between the alternatives; (5) What are the differences in Reliability, Availability and Maintainability (RAM) between the alternatives; (6) What are the differences in transportability and deployability between the alternatives; (7) What are the Manpower and Personnel differences between the alternatives. The MPA was assessed against the following two EEAs; (1) Determine MP Force Structure requirements for the NLOS-CA COEA; (2) Determine the personnel requirements by Military Occupational Specialty (MOS) and grades for the NLOS-CA and the LRSM alternatives. Assessment of these EEAs was based on analysis of 27 Measures of Performance (MOP) and Effectiveness (MOE). The analyst ranked the alternatives across multiple levels of hierarchical criteria. The methodology is discussed in detail in Appendix G of the report. The alternatives were compared for each MOP and MOE. MOPs and MOEs were compared for their relative importance to each sub-analysis area. In turn, the sub-analysis areas were compared for their influence on the logistics impact of each EEA. Finally, the relative influence of each EEA on the logistics impact was established.

4. **RESULTS.** Logistics Impact - Alternative 1 versus Alternative 2.

A. The overall Logistics Impact, i.e. logistics burden, of Alternative 2 is marginally greater than that of Alternative 1.

B. The impact is greatest in the Supply EEA. The LRSM firing rate is at least twice that of the NLOS-CA. This drives a higher ammunition supply requirement. The heavy version of the LRSM is tracked, thus requiring more fuel. This is further increased by the higher usage rates applied to the heavy scenario.

C. The NLOS-CA requires more maintenance support. Under a two-level maintenance concept a Direct Support (DS) contact team replaces any unit maintenance. This significantly increases workload at that level and may represent some risk in the maintenance supportability area.

D. The NLOS-CA is electronics-intensive and will require Test, Measurement, and Diagnostic Equipment (TMDE) from division assets that already support other systems. The LRSM has very little requirement for WS maintenance in the field.

E. The LRSM is fully interoperable within the present four-level maintenance system.

F. Estimated manpower requirements for both NLOS-CA and LRSM are similar. The relative logistics impact is minimal, however, because no

"bill-payer" system has been identified, all manpower requirements represent a net addition to current level.

G. MOP/MOE Results. Although overall logistics impact is almost equal, there are significant differences in impact in fuel consumption and Maintenance Ratio (MR), material handling equipment (MHE), TMDE and maintenance concept. These differences are as follows:

(1) Fuel Consumption and Maintenance Ratio (MR). The M1064, tracked carrier used in the heavy configuration of LRSM accounts for both greater fuel consumption and MR for the LRSM versus the NLOS-CA.

(2) MHE. The six round missile storage/launch containers require on-board MHE for loading and downloading NLOS-CA missiles. The dimensions and weight of the containers will also require the availability of MHE throughout the ammunition pipeline. These requirements represent a significant logistics impact for the NLOS-CA vs. the LRSM which requires no special or additional MHE for ammunition handling.

(3) Maintenance Concept. The stated maintenance concept for the NLOS-CA does not provide organic assets for unit level maintenance on the NLOS-CA gunner's station. Unit level maintenance (Line Replaceable Unit (LRU) diagnosis, remove and replace) will be performed by the Forward Maintenance Teams from the DS Organization. This will increase the workload of DS maintainers who are already supporting other WSs throughout the Brigade area of operations.

(4) TMDE. The electronics-based NLOS-CA gunner's station requires TMDE support for LRU diagnosis and repair. Although, the estimated TMDE workload is not significant, it represents an additive requirement for another Test Program Set (TPS) and an additional burden on a critical and heavily used maintenance asset.

(5) Operator Training. A high level assessment was conducted to assess whether or not MOS 11H (Heavy Anti-Armor Weapons Infantryman) possesses the necessary physical attributes and prerequisite skills and knowledge to operate the NLOS-CA gunner's station. The assessment was limited to the NLOS-CA gunner's station operation and was based on data extracted from the Target Audience Description (TAD) contained in the NLOS-CA System MANPRINT Management Plan (SMMP). MOS 96H (Aerial Intelligence Specialist) was used as the baseline MOS for comparability analysis. Armed Forces Qualification Test (AFQT) and Armed Services Vocational Aptitude Battery (ASVAB) scores, education level, and Physical capacity, Upper extremities, Lower extremities, Hearing, Eyes, Psychiatric (PULHES) classification were used as analysis criteria. The results of the analysis indicate that there is some risk in assuming that the 11H MOS is an appropriate MOS for the NLOS-CA gunner position. This risk is associated primarily with requirements for color vision and ASVAB requirements.

6. CONCLUSIONS. The overall Logistics Impact of Alternative 2 is marginally greater than that of Alternative 1. Given that the NLOS-CA and the LRSM in the light configuration both use the heavy HMMWV, and, if firing rates and usage rates are very similar, then similar logistics impacts can be anticipated. If a more detailed MP and operational concept for the LRSM becomes available, then the logistics impact should be reassessed.